

Chevron Osteotomy for Treatment of Hallux Valgus : A Preliminary Report

AREE TANGRATANAVALEE, M.D.
VINAI PARKPIAN, M.D.
CHAITHAVAT NGARMUKOS, M.D.
ADISORN PATRADUL, M.D.

Department of Orthopaedic Surgery, Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand.

Abstract : A retrospective study of 11 patients underwent 12 chevron osteotomies of the first metatarsal bones for correction of painful hallux valgus at Chulalongkorn hospital between December, 1987 and May, 1991. The average follow up was 17 months, 92 per cent of patients were satisfied with the postoperative pain relief and cosmetic result. There was no significant problem in footwear. One patient had superficial infection. The average correction of the first intermetatarsal angle and the first metatarsophalangeal angle were 4.9° and 9.2° respectively. The chevron osteotomy, in our experience, might be a worthwhile alternative procedure for the treatment of hallux valgus.

INTRODUCTION

Hallux valgus, a deformity of the first metatarsophalangeal joint, is characterized by lateral deviation of the proximal phalanx. Until recent years, this problem has not been truly addressed in Thailand. Changing in custom and styles of footwear have led to an increasing number of patients requiring surgery for the relief of pain or for cosmetic effect. Various different surgical procedures had been described. Among them, distal metatarsal osteotomy is the most commonly used procedure¹. Mitchell osteotomy provides excellent correction of deformities, but it does have some common complications¹, such as, postoperative displacement, dorsal angulation, non-union and metatarsalgia. Chevron osteotomy¹, an alternative distal metatarsal procedure, is technically easy, stable without shortening of the first metatarsal. This procedure provides not only high rate of satisfaction but also low rate of complications. This retrospective study was done to assess the result of this technique and also the advantage of Kirschner-wire fixation.

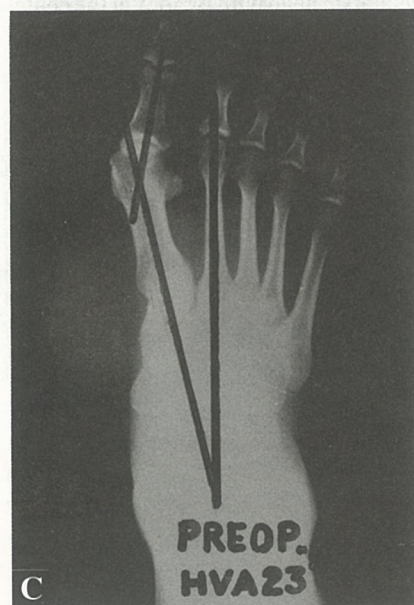
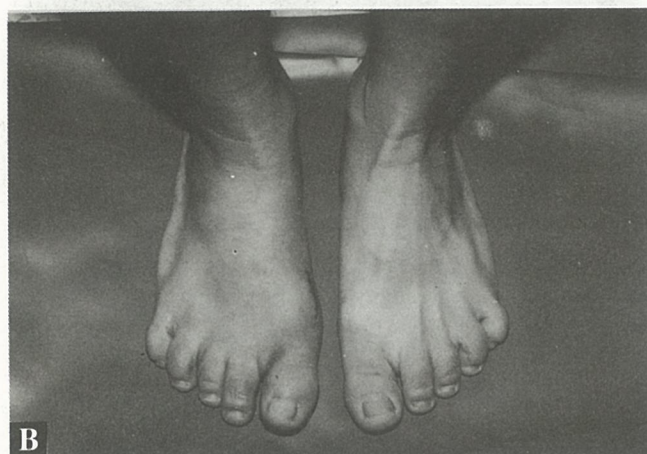
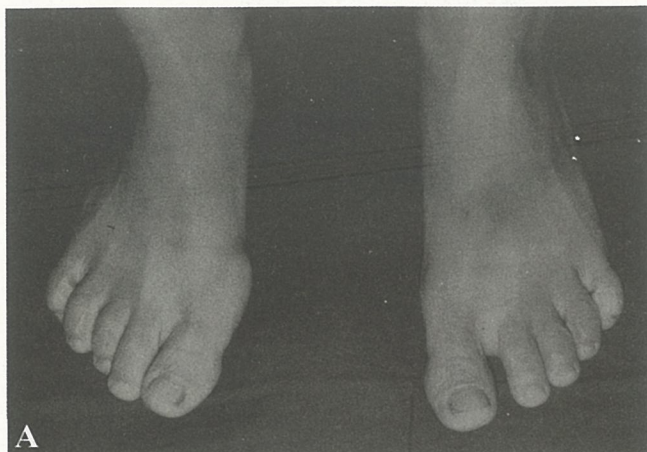
MATERIALS AND METHODS

From December, 1987 to May, 1991, thirteen patients

(14 feet) underwent chevron osteotomy, eleven patients (12 feet) returned for follow-up in an average of 17 months (range, 2-44 months). Ten were female. Their average age was 36.6 years (range, 27-57 years). All patients presented with painful bunions with the average symptom of 18.3 months (range, 9-33 months), two of them also complained of the deformity. Of the twelve feet, nine were right and three were left. The metatarsophalangeal angle or hallux valgus angle (HVA) averaged 26.8° (range, 19-43°) and the first intermetatarsal angle (IMA) average 15.9° (range, 11-19°). The operative technique, described by Johnson¹ (1979), was carefully followed. A medial straight and distally base Y-shaped capsulotomy, medial exostomy were then performed. A 60° V-shaped osteotomy of metatarsal head with its apex at the center of the circle formed by the articular surface was made with an oscillating saw. The metatarsal head was then displaced laterally about one-third of its transverse diameter. The osteotomy site was transfixed with a 0.045 or 0.062 inch Kirschner-wire before the medial bony protuberance was trimmed and the capsular suture was advanced proximally. The skin was closed and the foot was wrapped with a compression bandage. The patients were allowed to have progressive weight bearing ambulation and the K-wires were removed 4-6 weeks postoperatively.

RESULTS

The average hospitalization was 4.3 days (range, 2-14 days) and all patients could walk normally between 14-45 days (averaged 24.8 days). The follow up period average 17 months, range, 2-44 months). Pain relief and cosmetic effect were evaluated by the patients as very satisfied and dissatisfied according to their expectations. Four patients, one of them had bilateral operation in different period of time, were very satisfied, six were satisfied and one was dissatisfied with the pain relief. One who had bilateral operations were very satisfied and ten were satisfied and very satisfied with the pain relief.



In symptomatic aspect, all of the very satisfied patients had pain relief without analgesics and good ability to wear normal shoes. In the satisfied group, two patients had minor reservation which was occasional pain on wearing shoes while another four patients, habitually wearing slippers without pain, had mild discomfort on wearing shoes. In dissatisfied group, the only patient always had pain on wearing shoes. In cosmetic aspect, all patients were pleased with the good looking and the decrease of medial prominence of the feet. The best one who had bilateral procedures felt very satisfied because of the good contour of the feet and the minimal postoperative scars. The subjective results were (for pain relief) 41.7 percent (five feet) complete satisfaction, 50 percent (six feet) satisfaction with minor reservation, 8.3 percent (one foot) dissatisfied and 91.7 percent (eleven feet) overall satisfaction. All patients were satisfied with the cosmetic result.

The postoperative HVA and IMA averaged 17.6° (range, $9-30^\circ$) and 11° (range, $7-14^\circ$) respectively. The corrected angles averaged 9.2° for HVA and 4.9° for IMA (fig. 3). The postoperative ROM of the first MP joint averaged 58.2° (range, $20^\circ-80^\circ$). All stated that the ROM of the first MP joint and the power of the great toe did not decrease postoperatively. The remaining hallux valgus angle (HVA was more than 20°)⁸ occurred in four feet. All were classified in pain-satisfied with minor reservative group. One foot developed superficial infection and was treated with antibiotics and secondary suture on the thirteenth postoperative day. No patient had paresthesia along the medial side of the great toe.

DISCUSSION

Chevron osteotomy was first performed by Austin² (1962) in 300 patients with high satisfied rate and very low complications. Johnson¹ (1979) reported 26 osteotomies with complete satisfaction, and another authors^{3,4,5,6,7} also reported high satisfaction for this type of osteotomy. Most of our patients were also satisfied with the results although we had four patients with remaining hallux valgus by radiologic criteria⁸. The average corrected angles, 9.2° for HVA and 4.9° for IMA, seem to be in the same ranges as those of many studies^{1,3,4,6,7,9} (range, $6.6-15^\circ$ for HVA and $3.3-7^\circ$ for IMA). In our experience, proximal advancement of the capsular flap after lateral displacement of the metatarsal head played an important role for maximal correction of HVA. To prevent displacement, we used a Kirschner wire for fixation¹⁰ of the

Table I. Data collected from the study

No.	age (yr.)	pain relief	cosmetic effect	occ. pain	ROM of 1stMPJ	power of great toe	HVA		IMA		Complication
							preop	postop	preop	postop	
1	34	v.sat	sat	-	$\wedge 65^\circ$	s	29	20	19	13	-
2*	27	v.sat	v.sat	-	$\wedge 80^\circ$	s	19	9	14	9	-
3*	29	v.sat	v.sat	-	$\wedge 65^\circ$	$\wedge$	19	14	16	10	-
4	37	sat	sat	-	s 55°	s	30	23	18	14	remain.HV
5	30	sat	sat	-	s 48°	s	30	21	17	12	remain.HV
6	35	sat	sat	y	s 40°	s	40	26	19	13	remain.HV
7	38	v.sat	sat	-	$\wedge 70^\circ$	$\wedge$	19	14	18	13	-
8	57	v.sat	sat	-	$\wedge 65^\circ$	$\wedge$	24	12	14	10	-
9	46	dissat	sat	y	s 55°	s	24	17	16	12	-
10+	41	sat	sat	-	s 20°	s	43	30	17	12	remain.HV infection
11	34	sat	sat	-	$\wedge 60^\circ$	s	21	13	12	7	-
12	31	sat	sat	-	$\wedge 75^\circ$	$\wedge$	23	12	11	7	-

* The same patient with bilateral osteotomy

+ The 1st MPJ had osteoarthritic change

occ.pain : occasional pain

v.sat : very satisfied

sat : satisfied

dissat : dissatisfied

y : yes

s : same

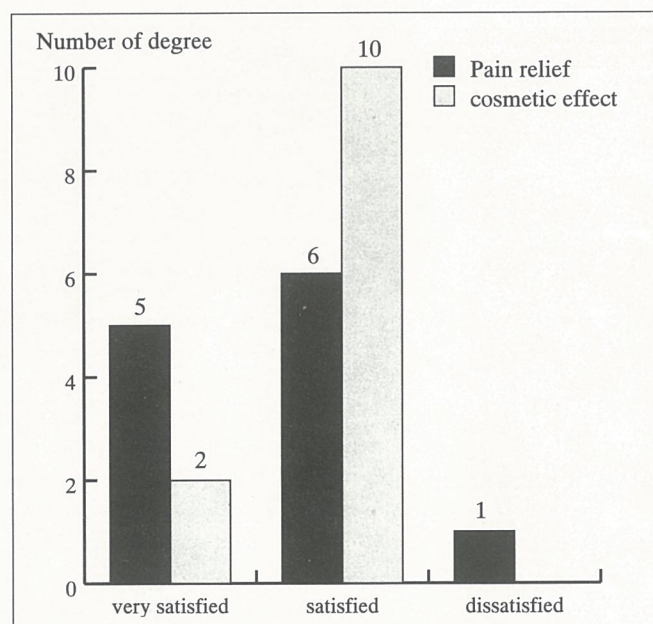
 $\wedge$: increase

Fig. 2 Graphic representation of subjective results

metatarsal head and removed between 4-6 weeks. This caused no effect in ROM of the first MPJ joint. Four patients, having remaining hallux valgus postoperatively, had preoperative

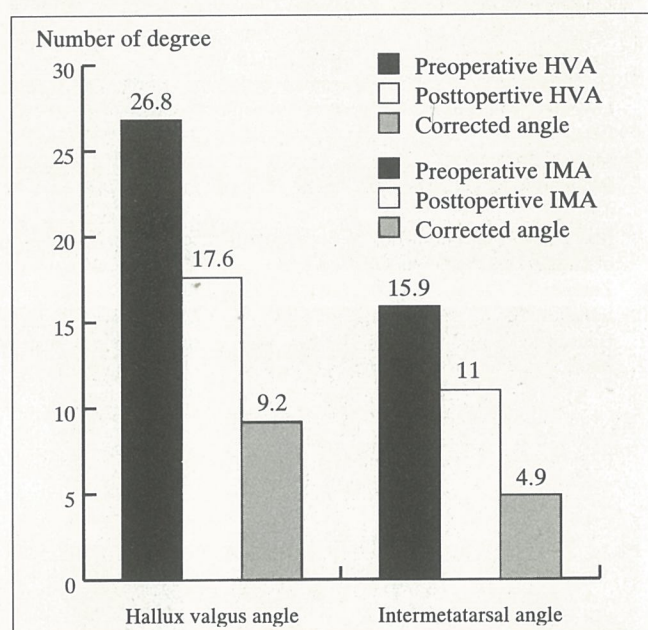


Fig. 3 Comparing between preoperative and postoperative angles of HVA and IMA

HVA 30° or more. Although the average corrected HVA angle in this four patients was high (10.75°), the procedure could not decrease severe HVA to the normal range 11° . According to our study, we agree with Mann^{8,12} that chevron osteotomy should not be performed in patients whose HVA are more than 30° .

The possible precipitating cause for the infected case was that the patient was still suffering from the inflamed bunion during the perioperative period. Other complications such as nonunion, avascular necrosis, displacement, angulation and paresthesia did not occur. Although avascular necrosis of

the metatarsal head was reported as high as 20 per cent by Meier and Kenzora⁶, most authors^{1,3,4,7} reported no or low incidence of this complication. We believe that careful capsular dissection and retraction during osteotomy should prevent this severe complication. According to Mann^{8,12} chevron osteotomy should be performed in patients that have congruent joint and are not more than fifty years old. In our study, we had a severe hallux valgus with incongruent joint (case 10) and a 57-year-old mild hallux valgus (case 8), but both were pleased with the results. Because of our small number of cases we could not conclude that the appropriate age and congruent joint could effect the results.

The first MP joint stiffness after distal osteotomy was another problem described by Scranton¹⁰, but our patients had increase or the same ROM compared with that in the

preoperative period. The most severe case had 20° of postoperative ROM because of the osteoarthritic change of the joint. This patient still had the same that in the initial state.

The advantages of chevron osteotomy are; first, the osteotomy site is in cancellous bone and bony union can occur easily. Second, the osteotomy site is stable in anteroposterior plane. It prevents angulation in this direction and cause no shortening of the first metatarsal. Thirdly, no cast is need for immobilization, so patients are postoperatively more comfortable and finally, patients can have early ambulation and active ROM as tolerated. The disadvantages are first, of the joint. Second, during osteotomy, if joint capsule is over divided and retracted, avascular necrosis of metatarsal head may occur. Finally, the patients must undergo the second operation for the Kirschner-wire removal.

REFERENCES

1. Johnson KA, Cofield RH, Morrey BF. Chevron osteotomy for hallux valgus. *Clin Orthop* 1979;142:44-7.
2. Austin DW, Leventen EO. A new osteotomy for hallux valgus : A horizontally directed V displacement osteotomy of metatarsal head for hallux valgus and primus varus. *Clin Orthop* 1981;157:25-30.
3. Hendrix MRG, Devis BL. Chevron osteotomy of the first metatarsal for hallux valgus. *S Afr Med J* 1989;76:413-6.
4. Leventen ED. Etiology and treatment of hallux valgus : The chevron procedure. *Orthopaedics* 1990;13:973-6.
5. Lewis RJ, Feffer HL. Modified chevron osteotomy of the first metatarsal. *Clin Orthop* 1981;157:105-9.
6. Meier PJ, Kenzora JE. The risks and benefits of distal first metatarsal osteotomies . *Foot Ankle* 1985;6:7-17.
7. William WW, Barrett DS, Copeland SA. Avascular necrosis following chevron distal metatarsal osteotomy : A significant risk. *J Foot Surgery* 1989;28:414-6.
8. Mann RA. Decision Making in Bunion Surgery. In : Green WB,ed. Instructional course lectures. Vol. XXXIX Park Ridge, Illinois, American Academy of Orthopaedic Surgeons 1990:3-13.
9. Zimmer TJ, Johnson KA, Klassen RA. Treatment of hallux valgus in adolescents by the chevron osteotomy. *Foot Ankle* 1989;9:190-3.
10. Scranton PE Jr. Current concepts review : Principle of bunion surgery. *J Bone Joint Surg(Am)* 1983;65:1026-8.
11. Hattrup SJ, Johnson KA. Chevron osteotomy : Analysis of factors in patients' dissatisfaction. *Foot Ankle* 1985;5:327-32.
12. Mann RA. The great toe. *Orthop Clin North Am* 1989;20:519-33.